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Short Article

The James Webb Space Telescope (JWST) Anomalies Resolved

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Abstract
A model of the universe is offered that can derive the Hubble Constant independent of empirical measurement, using just a midline estimate of the age of the universe and simple arithmetic calculations. It can explain the JWST discoveries of apparent anomalous early galaxy formations without need of substantial revisions to established astrophysical theories, as the new findings have seemed to require. Concepts of "Dark energy", cosmic flatness, cosmic inflation, and an accelerating expansion of the universe are rendered unnecessary or at least partly misinterpreted.

Keywords: Cosmology, Astrophysics, James Webb Space Telescope, JWST

1. Introduction

The James Webb Space Telescope (JWST) has brought considerable astrophysical disarray with the discovery of primordial galaxies, which by their apparent distances and ages seem to undermine the established model of the universe. Several galaxies have appeared to be even older than the universe, and many seem to be well formed much earlier than it was thought possible.

Astrophysicists have adapted to the new evidence with commendable flexibility, abandoning the established theory of galaxy formation that predicted some two billion years of prerequisite development. But the previous consensus was based on persuasive considerations, and an interpretation that would restore much of the conventional understandings should be considered worthy of serious investigation.

I contend that the JWST anomalies can be resolved with a cosmological model that restores the newly discovered galaxies within previously expected timeframes. The universe will be represented here as a four-dimensional (hyper)sphere -- not a "hypersphere" (a mathematical model consisting of numerous spatial dimensions) -- but rather, a three-dimensional spatial surface with the fourth dimension being an immaterial interior, the dimension of time. The sphere is considered to expand at the speed of light in all directions, with time impelling the enlargement, advancing a constant one year of radius with a corresponding pi-relation that expands the surface of the sphere with acceleration. The model conforms to the concepts of spacetime of Einstein and Hermann Minkowski, but with the relativity of interactions playing out only on the surface of the (hyper)sphere [1,2]. I have discussed the idea of time in its dynamic relation to space in detail elsewhere, but will focus here only on the proposed cosmological utility of the concept [3].

My hypothesis departs from the prevailing belief among many astrophysicists that the universe is flat, and anyway, recent findings have already undermined that consensus, renewing preferences for various shapes other than flatness, including the spherical [4]. An important aspect of the flat universe theory has been a belief that the energy of outward expansion would have to be balanced by the energy of inward gravitational pull, but in the model I am presenting, gravitation is lateral along the surface, and is independent of the radial expansion.

Several demonstrations of the utility of conceiving a four-dimensional universal (hyper)sphere will be explored, first showing how it results in a rate of surface enlargement in-line with the various estimates of the Hubble Constant, calculated independent of empirical input or analysis -- just an assumed universal age of 13.75 billion years.

Second, it will be shown how the principal anomalies (the unexpected discovery of apparently extreme ages, brightness, and maturity of distant galaxies) found by the JWST can be resolved according to the same spherical model. Third, it will be argued that the model eliminates the need for various theoretical constructs like cosmic inflation and dark energy, given that a *uniform* increase in the radius of a sphere, driven by time, is what produces an *accelerating* expansion of its surface.

Space is treated as the surface of a four-dimensional (hyper)sphere with a radius expanding at the speed of light in all directions. The Hubble Constant H0 is derived from 1) a radius of 13.75 bn yr, 2) the pi ratio of radius surface, and 3) the ratio of one Mpc to the surface at a given time.

Figure 1

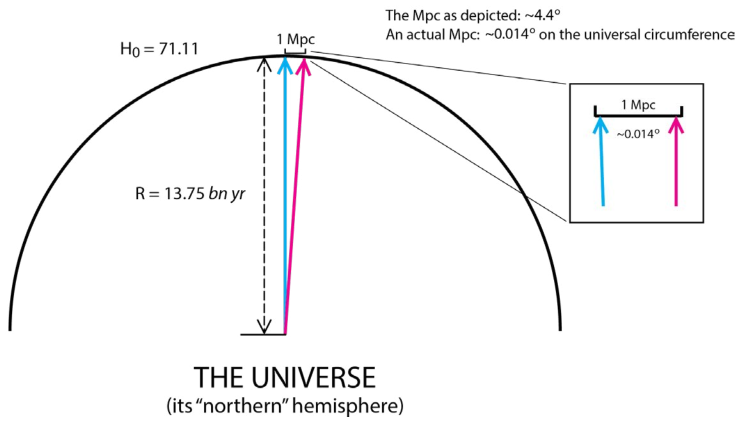


Figure 1: Treats the Universe as a "(Hyper) Sphere" with a Current Radius (R) = 13.75 *bn yr* (Billion Years), and a Hubble Constant (H0) of 71.11 km/sec/Mpc. Both Numbers Fall within the Margins of Commonly Accepted Estimates

The circumference of the (hyper)sphere: **c1** = 2π**R** = $8.63937979737193 \times 10^{10}$ lyr (light-years) (1)
Circumference +1 year: **c2** = 2π(**R**+1) = $8.63937979800025 \times 10^{10}$ lyr (2)
Increase of the circumference in the most recent year: **cd** = **c2** - **c1** = 6.2831878662 lyr (3)
Megaparsecs in the circumference at year **c2: m** = **c2** ÷ 1 Mpc* = $2.64884588779 \times 10^{4}$ Mpc (4)
Derive the **cd** per 1 Mpc: **cm** = **cd** ÷ **m** = $2.37205192993598 \times 10^{-4}$ lyr (5)
Convert cm to km: **ck** = **cm** x $9.4607304725808 \times 10^{12}$ km = $2.24413439752492 \times 10^{12}$ km (6)
Divide by seconds per year: **H0** = **ck** ÷ 3.15576×10^{7} = 71.11 km/sec/Mpc (7)

(**See note 5* for Mpc converted to light-years and km per light-year)

The assumption of the age of the universe and the derivation of the Hubble Constant are roughly in the middle of current empirical estimates. (If for example the age of the universe is held instead to be 13.5 *bn yr*, H0 is 69.82; if it is 14.0 *bn yr,* H0 is 72.40.) I maintain that the close correlation between the advancing cosmic radius on such a (hyper)sphere and the expansion of the arc on the surface per an Mpc (H0) suggest at least a remarkable coincidence, worthy of investigation.

If it is objected that the model is inconsistent with evidence that the universe appears to be flat, an Mpc on such a (hyper)sphere would comprise only 0.014° (of 360°) on the circumference, and space would therefore be nominally flat for more than an Mpc in every direction.

Figure 2

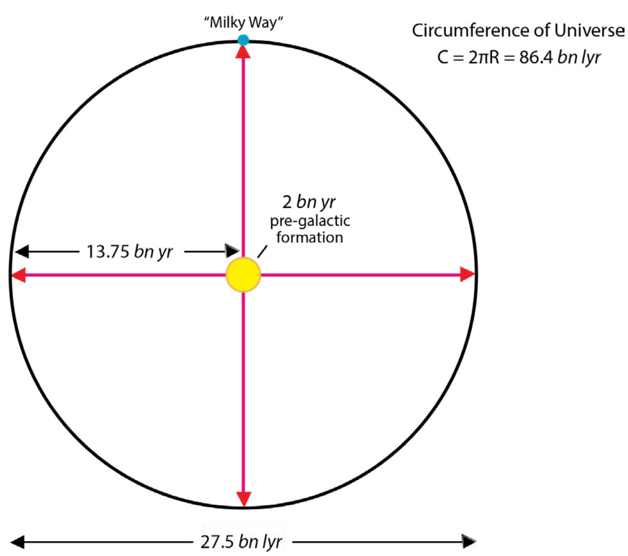


Figure 2: Provides an Overall View of the (hyper) Spherical Model in Two Dimensions

The small yellow sphere surrounding the center in **Fig.** 2 represents the age when galaxies have been thought to have first formed, at about 2 billion years. In this regard, I have adhered to a pre-JWST expectation.

A diameter of 27.5 *bn lyr* yields a circumference of 86.4 *bn lyr*, even less than a recent estimated universal diameter of 93 *bn lyr* and even that magnitude is only of the "observable universe." But although a sphere is, of course, three dimensional, the (hyper) sphere is four-dimensional, with a four-dimensional *surface* (an admittedly hyper- intuitive concept), which indicates a universal spatial volume larger than conventional estimates [5-7].

It is commonly thought that the universe is expanding at an accelerating rate due to "Dark Energy." But given the calculation of the surface area of a three-dimensional sphere ($A = 4\pi r^2$), and disregarding the implications of a four- dimensional surface ($A = 4\pi r^3$?), at a radius of 13.75 bn yr the surface would be 2375.8^3 *bn lyr*^{2} (billion light-years); adding +0.25 *bn* to the radius, at 14.00 *bn*, the surface would be 2463.01 (an increase of 87.18); adding another 0.25 to the radius, at 14.25 *bn*, it would be 2551.76 (an increase of 88.75). Thus, as the radius of the universe increases at a constant *c*, its surface area increases with acceleration. Time, as a universal dynamic, thus determines a uniform expansion of the radius of the universe and an accelerating surface-area, with no need of a "cosmological constant", or a "dark energy."

Regarding the aspect of time in the (hyper)sphere model, recall that Einstein's and Hermann Minkowski's Special Relativity revealed time and space to be a continuum (as spacetime), with time as the dynamic aspect -- a physical *principle*, not an *energy*. Cosmologically, the dynamic of time can be interpreted as that which drives universal expansion in every direction on the surface, and at the speed of light, i.e., the *speed of time* (described in detail in *reference note 3*), without invoking the oddities involved with the idea of "dark energy" (which would become the bane of current cosmology): A supposed inexhaustible force that was first offered to provide a cosmological period of accelerated expansion to explain the uniformity of the cosmic microwave background, and more generally, to offer a relentless, actually un-force-like, un-energy-like effect against the resistance to such an energy by the mass of the universe.

Figure 3

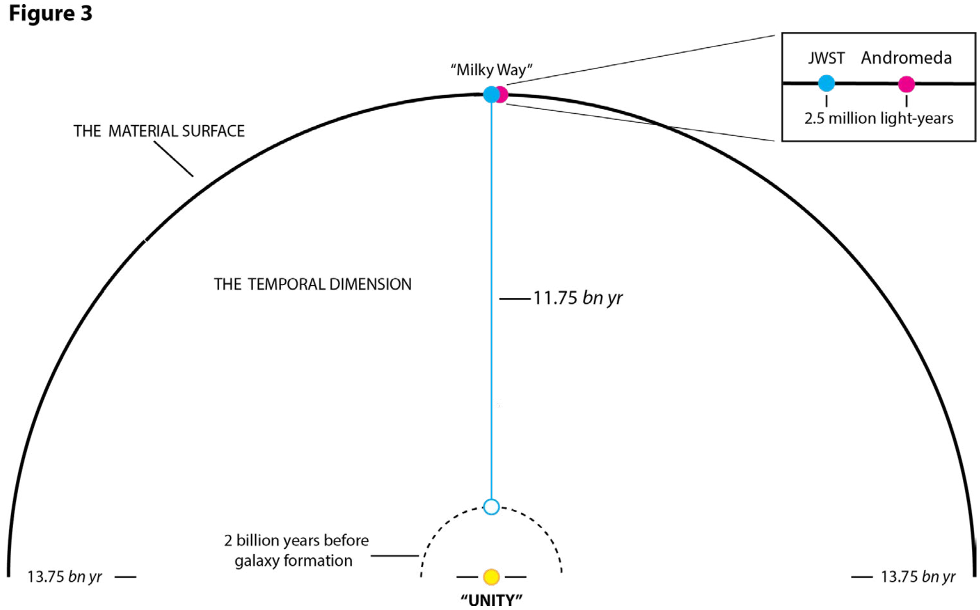


Figure 3: Is a Two-Dimensional "Look-Down" View on a Hemisphere of the Model, which Will be Developed in what Follows to Explain the Apparent Anomalies Discovered by the JWST

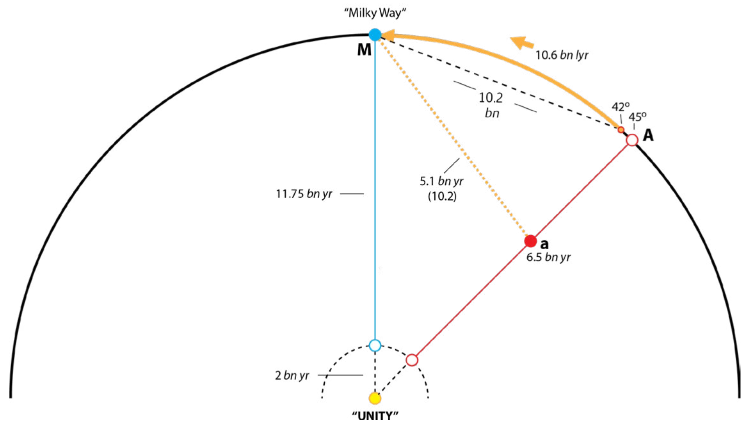
(I prefer the term "Unity" to "The Big Bang"; the latter seems tantamount to referring to a god or "God" in an otherwise serious theology as "The Big Guy.")

The blue vector shows the Milky Way advancing in time along a radius of the universal (hyper)-sphere from its formation at 2 billion years after "Unity" to its present age of 11.75 *bn yr*.

The magnification shown in the expansion box at upper-right illustrates the immensity of the scale being viewed: At relatively short distances, spatial expansion and curvature are insignificant. The distance to the Andromeda galaxy, a separation of about 2.5 million light-years, is only about 0.00003 degrees of separation on the surface of the (hyper)sphere, which is therefore nominally flat.

Distances here and in the following diagrams will be idealized, as any relatively minor local factors such as gravitation can be ignored.

Figure 4



Figures 4: Thru 6 use the Cosmological (hyper) Sphere Model to Explain the Most Troubling Anomalies so Far Observed by the JWST: the Apparently Excessive Ages, Sizes, Brightness, and Precocious Development of Newly Found Galaxies

The progression through time of galaxy **A** is represented as a vector on a two-dimensional surface. Like our galaxy, it is advancing with the radius of the (hyper)sphere at the speed of light (which is equated with the speed of time) at a 45° angle from our galaxy. With minor fluctuations due mainly to gravity, galaxies maintain their orientation in the expanding universe and continue to progress along a consistent trajectory at this scale.

The vector **aM** emanating from point **a** represents the radiation of light from **A** toward our galaxy from its age of 6.5 *bn yr*, arriving here at the present time. Point **a** is the unique position on **A**'s progression where the distance from its origin to its location at the emission, summed with the length of travel of the light to our galaxy, equals approximately 11.75 *bn yr*, the current age of both galaxies. As a ray of light having a length of 5.1 *bn yr*, vector aM, is actually 10.2 *bn lyr* in length. This is because unlike galaxies, which advance in time along their radii on the surface of the (hyper)sphere, light both advances with time and moves independently across space at light-speed, so it arrives at **M** in approximately half the time that is indicated by the distance. (The distance light must travel increases due to the expansion of space, but it is insignificant, less than 0.1 light-year per billion years.)

Three representations of the light ray are shown in **Fig. 4:** Vector **aM** displays it as flat, as from a perspective looking down on the sphere as on a two-dimensional semi-circle. The arc **AM** represents the same ray of light in profile, traveling along the surface of the sphere as-if by a 90° rotation of the diagram to place it on the horizon. The chord of **AM** is the same length as **aM**, but it is set in profile at the horizon to display the contrast between the "look-down" and the profile views. This is useful for a comparison of the apparent flat-vector travel of light aM with that of the actual arc **AM**. The arc is about 4% longer than the chord for **A**, but as will be seen, the differences between arc and chord increase with the distances between other galaxies and **M**. The speed of light is not exceeded in any case, but combined with the expansion of space. And all such differences, between the lengths of flat vectors and arcs, are essential to an understanding of the principal JWST anomaly:

2. Galaxies Appear More Distant than Expected Because Space is Curved, and Time is Linear

Figure 5

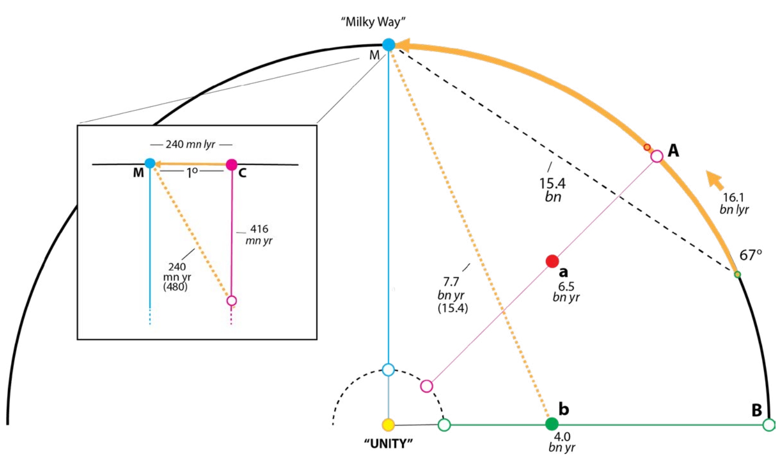


Figure 5: Illustrates the Contrast of a galaxy B, set at 90° Distant from M Along the Circumference, Twice as Divergent from M as A

The radiation of light from **b** to **M** is emitted at **B**'s age of 4.0 *bn* yr. The light travels 7.7 *bn yr* to reach our galaxy, which will be 15.4 *bn lyr* distant at reception along the vector **bM**. Galaxy **B** appears to us as it was approximately

7.75 *bn yr* ago. The actual arc of travel, from 67° along the surface toward **M**, extends 16.1 *bn lyr*, about 5% longer than the corresponding chord. The highly divergent vector of **B** relative to **M** also contributes to an initial red- shifting of **bM** due to the relative recession of its source at emission, but it is relatively insignificant, and can be ignored here.

Before the installation of the JWST, the distances to observable galaxies showed negligible discrepancies between their separations in time (of their radii on the (hyper)sphere) and space (along the surface). Only now, with the power of the JWST, have some significant differences become apparent. The variance of Galaxy **A**, at 45° from **M** on the circumference, might not be noticed to provoke controversy. But the vector of Galaxy **B** at 90° from **M** produces a more significant variance between space and time similar to galaxies that have recently been observed by the JWST. The light from **B** will seem as reaching us from more than 16 *bn lyr*. Having traversed an arc at 67° from **M, B**'s radiance will be calculated by its highly shifted wavelength, which not even counting the 2 *bn yr* prior to galaxy formation, will make it seem older than the universe. And its actual age at emission, 4.0 *bn yr,* will make it appear abnormally large and bright at the apparent distance.

The expansion box at the upper left on **Fig. 5** illustrates by contrast a more local relationship than can be represented on the scale of the hemisphere. Galaxy **C**, at a current distance of just 240 *mn lyr* (million light years) from **M**, is progressing almost parallel with **M** on the virtually flat surface of the very small segment of the sphere. About 416 *mn* yr ago (million years) ($b^2 = c^2 – a^2$), galaxy C emitted light that has traveled 240 *mn lyr* and also progressed along with the universal radius 240 *mn yr* to arrive here and now. The arc of travel on the surface and the corresponding chord are indistinguishable at this scale.

Figure 6

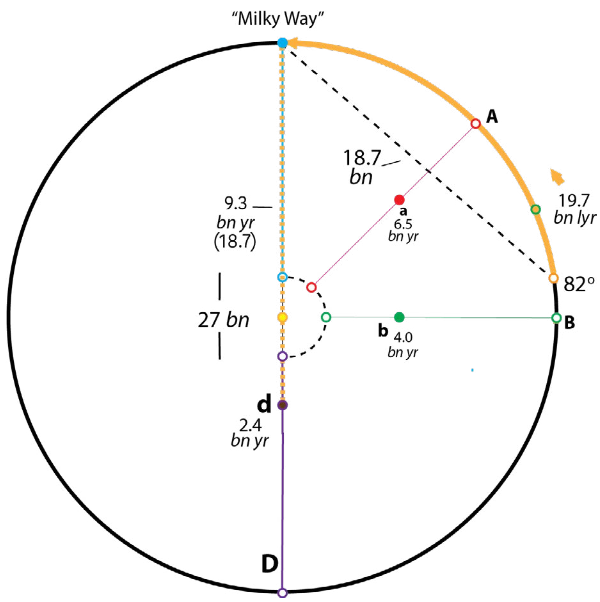


Figure 6: Illustrates How Even Light From The Most Distant Possible Source In The Universe Could At Least Potentially Survive The Journey To Be Detected Here, If Only With An Occasional Photon

Galaxy **D** is advancing along the radius of time at 180° from ours. For light to be visible from that distance, if only in principle, it would have to be emitted at point **d**, at **D**'s age of approximately 2.4 *bn yr*, and it would have to travel without interception along the surface of the (hyper)sphere for 19.7 *bn lyr* in 9.3 *bn yr* of time -- a theoretically possible but extremely unlikely and no doubt prohibitively faint occurrence due to the progressive dispersion of the light.

To make clear what the two-dimensional representation may obscure, the light from point **d** may seem to traverse a region backward in time, before galaxy formation. But all physical activity occurs on the surface of the universal sphere, every direction on the surface is homologous, and events that occurred on the earlier surface (like that at the 2 *bn yr* radius after pre-galactic formation) no longer exist when the subsequent expansion of the surface develops.

The example of galaxy **D**, given the factors assumed by the model, has emitted light 2.4 *bn yr* after galaxy formation, and its characteristics of size and brightness are as may be observed at our galaxy at the present time. Its wavelength as observed is determined not by the 9.3 *bn yr* it has taken to arrive, but by the 19.7 *bn lyr* it has traversed across the intervening expanding space. Its age might be estimated by present convention to be at least 19.7 + 2.4 *bn yr*. This is what accounts for the seeming perplexity of the phenomena brought to us by the JWST.

Several theoretical oddities discovered by the JWST and several cosmological problems are resolved with the present model. The apparent accelerating expansion of the universe commonly attributed to "dark energy" and the reintroduction of "the cosmological constant" have already been addressed, but it may need to be repeated: An acceleration of the expansion of the surface of a sphere is the product of the linear, or *constant* increase of the radius. (And we can ask: Whatever the shape of the universe, what sort of "energy", dark or otherwise, would maintain a relentless, or even *increasing* pressure against an expanding surface or range?)

The dynamic of time, a ubiquitous and self-evident everyday principle, can be invoked (with less taxation on the imagination) to describe a constantly extending radius which only secondarily determines an accelerating surface (by $A = 4\pi r^2$ or $4\pi r^3$). Time is already inextricably linked to space as *spacetime* in Einstein's and Minkowski's formulations, so invoking time as *the* fundamental cosmic dynamic, expressed in all the various interactions and relative deviations on the surface of the (hyper)sphere, requires no additional principle such as "dark energy" or "cosmic inflation."

The "Horizon Problem" or "Hubble Tension" has arisen due to evidence of a homogeneity of the universe that has evidently been beyond possible causal integration, as is suggested by the cosmic microwave background. But the various solutions that have been devised to try to understand the problem are likewise resolved with the present model of a unified (hyper)sphere driven by a central principle: time.

The Cosmic Microwave Background radiation (CMB) that has evaded absorption by mass until now has been circling the universe for about one-and-a-half billion years more than the earliest mass and "foreground" radiation of the universe. Consequently, it has an estimated Hubble number of only 67.4 +- 0.4, significantly less than galactic- era radiation. The current model can attribute CMB degradation as due to both its age and to so many near-misses with gravitational influences.

3. Conclusion

The idea of a four-dimensional (hyper)sphere expanding with time might be criticized as fanciful or exotic. But popular alternatives, such as the idea of an infinite flatness in three dimensions, and the *ad hoc* revisions of galactic evolution, are hardly more scientifically compelling. And those various models don't serve to resolve the JWST anomalies.

The present model of the universe has been shown to be consistent with calculations, notably the Hubble Constant, and by some calculation of assumed age according to its characteristics, and its distance according to a combination of wavelength as a component of travel time and space expansion. It serves to explain how there is nothing actually anomalous about the distant galaxies being discovered by the JWST, which only seem to be more distant, brighter, and more fully developed earlier than expected. The ideas of "cosmic inflation" a model invoked as an explanation for the evident homogeneity of the universe, "dark energy", and the "cosmological constant" are in the present hypothesis unneeded. The newly discovered phenomena are understood to be entirely due to the oddity of four- dimensional spherical geometry, with no need for *ad hoc* inventions like premature galactic development or a pre- "bang" population of residual galaxies from previous universes. It is an admittedly *odd* solution being offered here, but it is not a resignation to odd anomalies. And it is all just because space is curved, and time is linear.

If Hubble'd derive his Constant from the studied stars tomorrow t'would be regarded confirm'shun of this the proffered model.

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